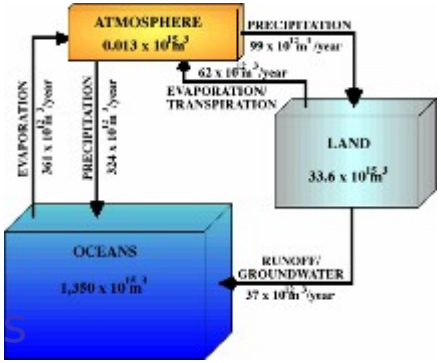
Integrated Water Resource Services

Water:

when scarce, a precious resource

when excessive, a source of many hazards



Gary Carter

NOAA Hydrology Program Manager

Interagency Meeting on Water Resources

May 31, 2007

Challenge: Water Resource Stewardship

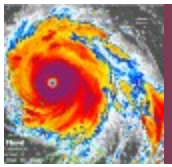
Water is essential for the health and well-being of society. It serves many needs and offers significant benefits that require careful, balanced management

- Public Safety (River Floods, Flash Floods, Debris Flow)
- Flood Control
- Water Supply
- Power Generation
- Drought Mitigation
- Recreation
- Agriculture
- River Commerce
- Ecosystem Health

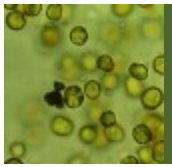
Climate change is impacting:

- frequency and pattern of hot days and nights over most land areas
- frequency and pattern of extreme precipitation events and resulting flooding over most areas
- extent of areas affected by persistent drought

NOAA's National and Regional Priorities



Hazard Resilient Coastal Communities

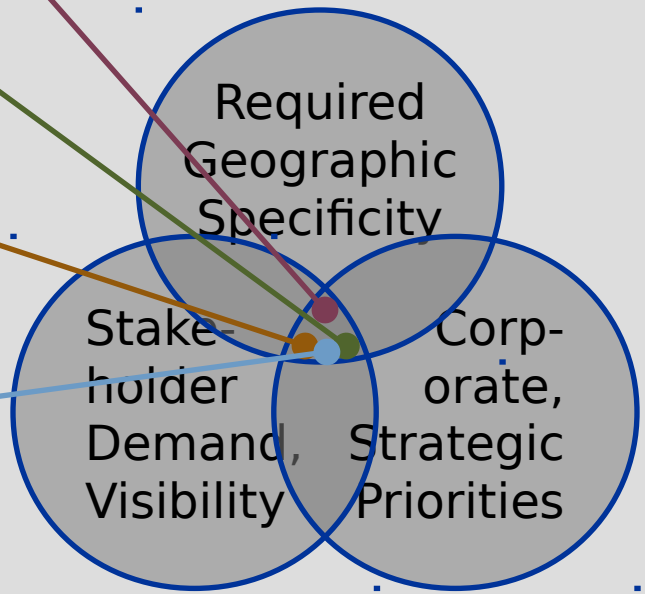


Integrated Ecosystem Assessments

Integrated Water Resource Services

Region-specific Priorities and Existing Commitments

These programmatic priorities are at the intersection of:

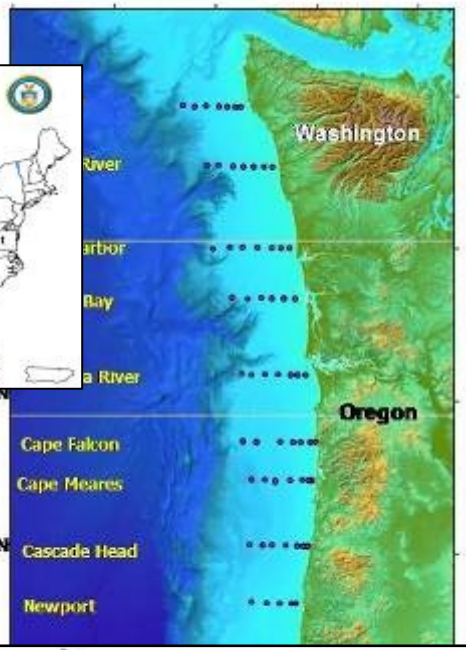


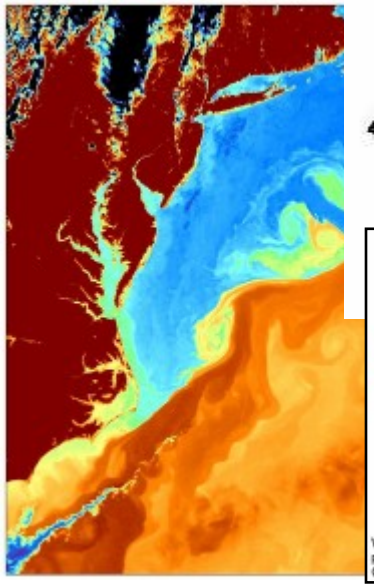
NOAA is using a new approach for execution priorities during FY 2007-2008, reflecting regional partnerships

NOAA's Capabilities: Water Prediction and Services

- **Satellite and Environmental Data**
  - ***Water surface conditions***
  - ***Land cover/land use***
  - ***Climate variability and change***
- **Oceans**
  - ***Water and biological monitoring***
  - ***Estuarine models***
- **Research**
  - ***Earth system models***
  - ***Environmental observing systems***
  - ***Great Lakes inflows, water levels, and water quality***
- **Fisheries**
  - ***Ecological and socio-economic assessments***
  - ***Habitat conservation and restoration***
- **Weather**
  - ***Weather, water, and climate monitoring and prediction***
  - ***Forecasting infrastructure and service delivery***
  - ***Hurricane storm surge forecasts***

Ocean Ecosystem Indicators of Salmon Marine Survival in the Northern California Current





NOAA's Role: Water Forecasts for Decision Makers

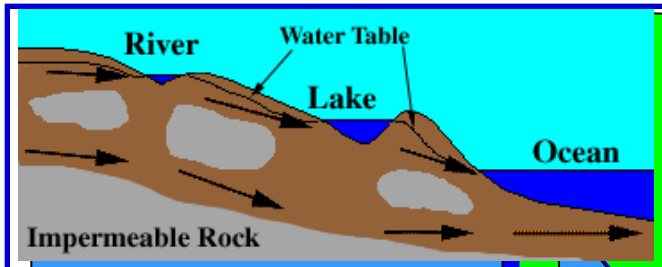
FLOODING AHEAD
TURN AROUND
DON'T DROWN

Weather and Climate Information:

Temperature

Precipitation

Wind, …



Water Information

Hydrology and Water Resource Modeling

"Summit to the Sea" Decision Support Tools

Water Management

Mitigation

Flood Control

Public Safety (Flash Floods, Debris Flow)

Water Supply

River Commerce

Power Generation

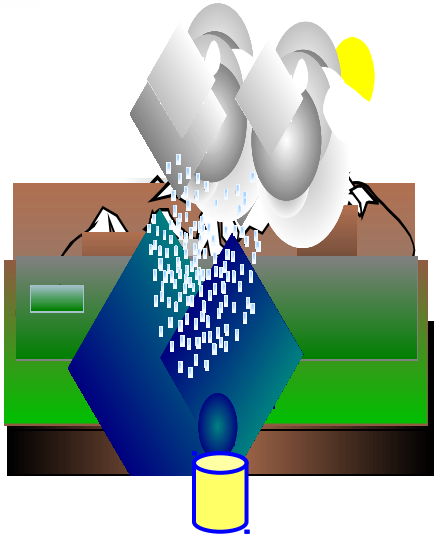
Agriculture

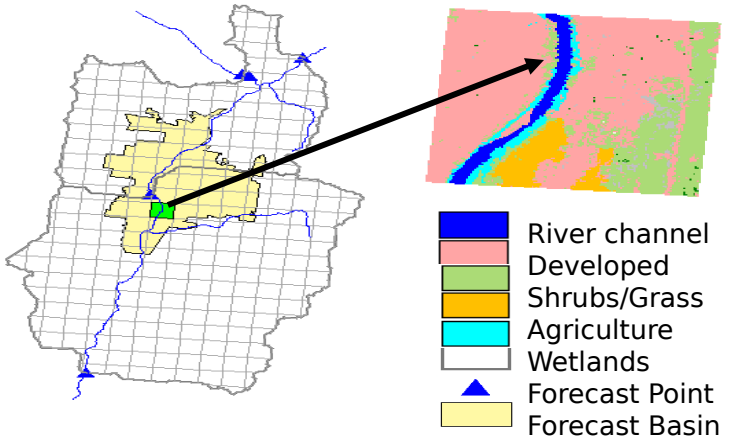
Recreation

Socioeconomic Sciences

Ecosy

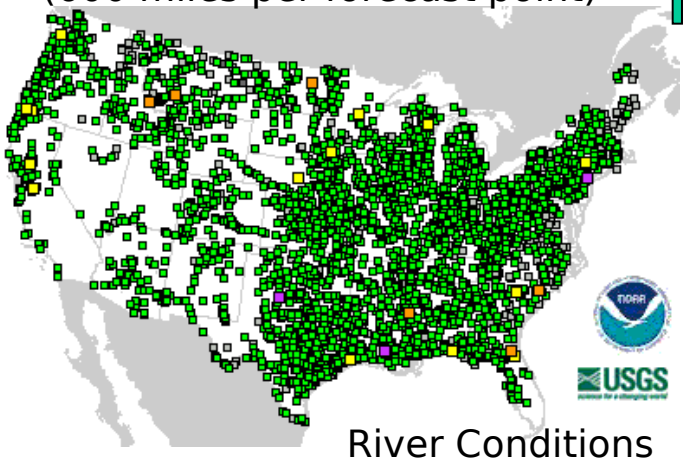
Water Forecasts for Protecting Life, Livelihood, and Way of Life





River Services

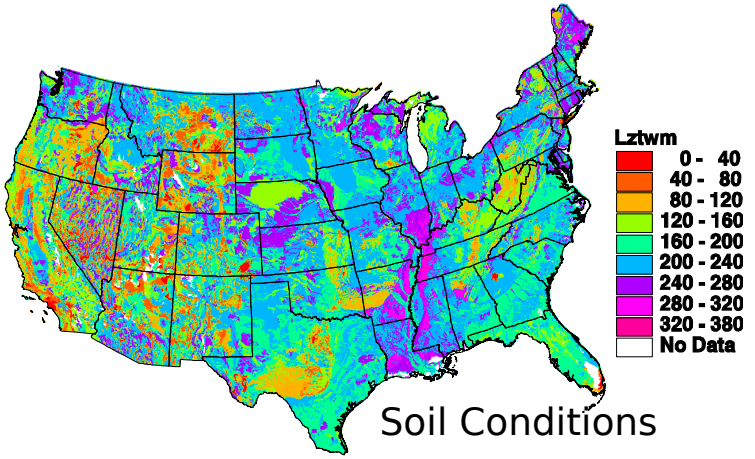
(600 miles per forecast point)



River Conditions

Water Resource Services

(6 square mile forecast basins)



Soil Conditions

CHPS - Community Hydrologic Prediction System

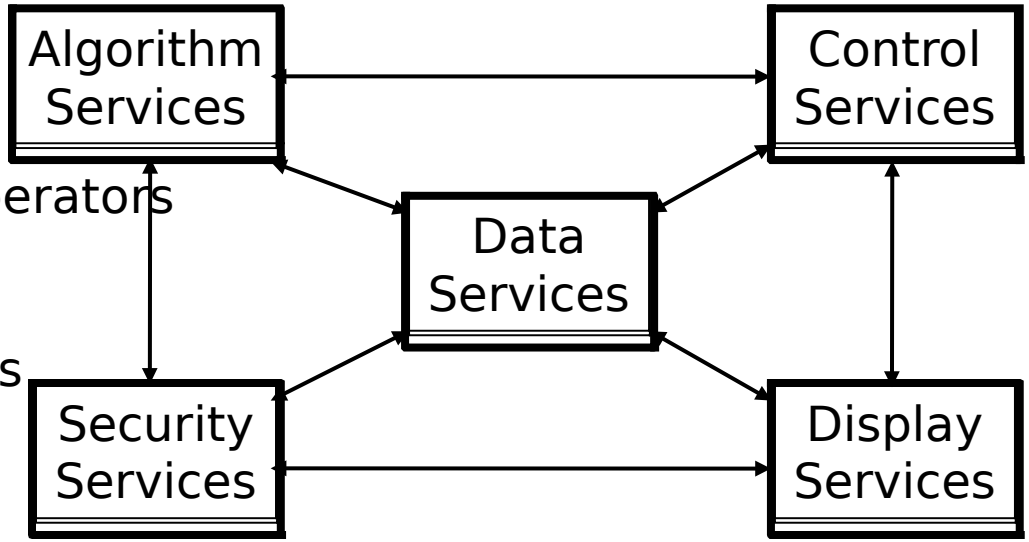
CHPS is ...

A new collaborative way of doing business in the hydrologic community

An open system architecture to easily accommodate the addition of new models and procedures

Taking advantage of advanced forecasting architecture to speed the development and research-to-operations process

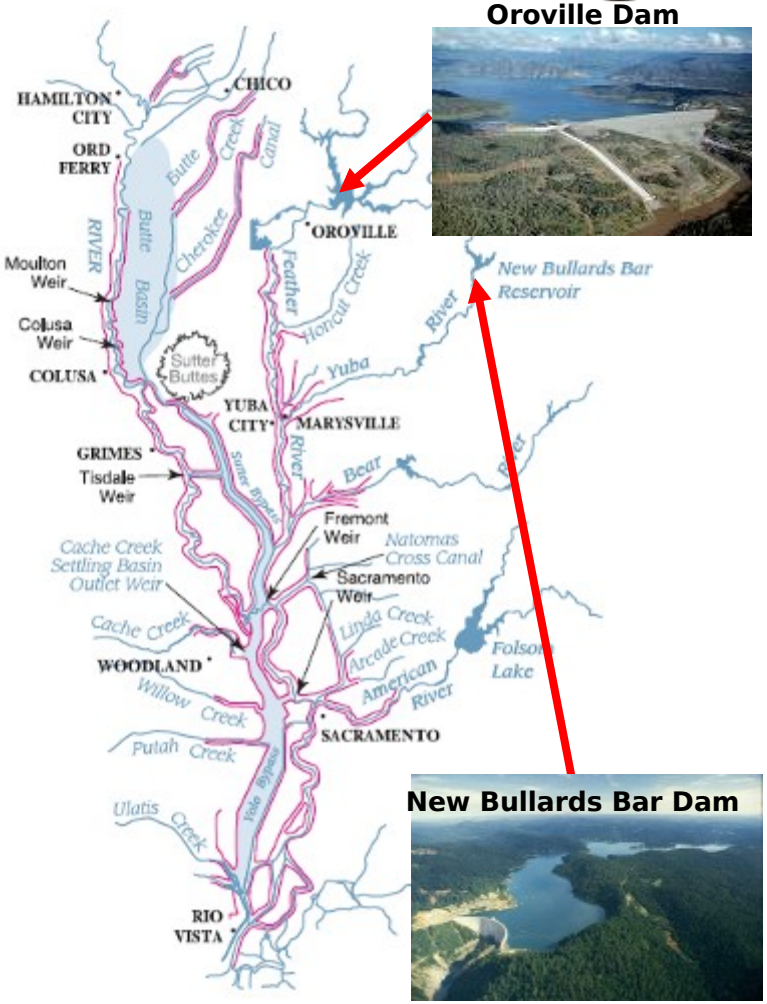
Federal agencies
State, regional, local cooperators
Universities
Private sector
International organizations



CHPS Real Life Example: Water Management in Northern California

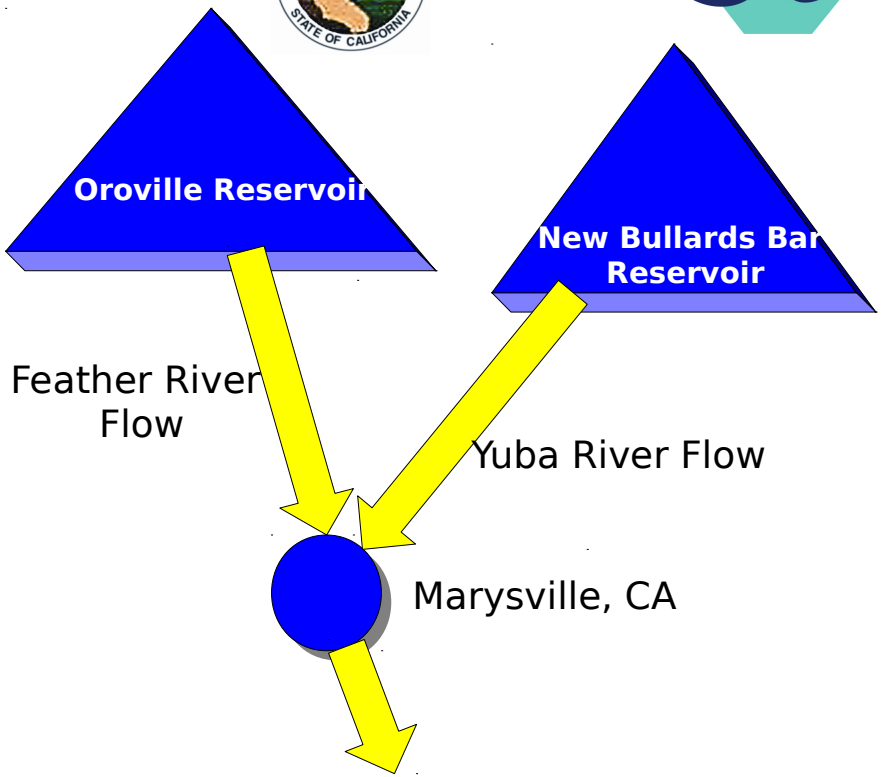
Northern California:

- Watersheds are large
  - Sacramento River (26,000 sq. miles)
  - Feather River (5,923 sq. miles)
  - Yuba River (1,340 sq. miles)
- Water Management Challenges:
  - Much unregulated flow
  - Significant rainfall and snowmelt
  - Long and variable water travel times
  - Combined natural and engineered systems
  - Multi-agency coordination



Forecast-coordinated Water Management Project

- River basins are interconnected
- Water management decisions are felt throughout the system
- The best decisions for managing capacity at the confluence take into account the current and future states of both basins
- Greatest benefit occurs when water management operations are coordinated



New Business Model for Water Forecasting - CHPS

Historically, organizations and groups

Worked independently

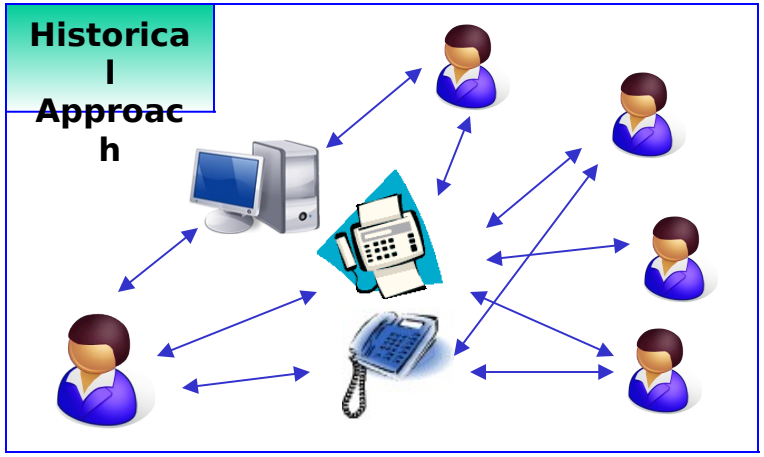
Developed their own unlinked systems

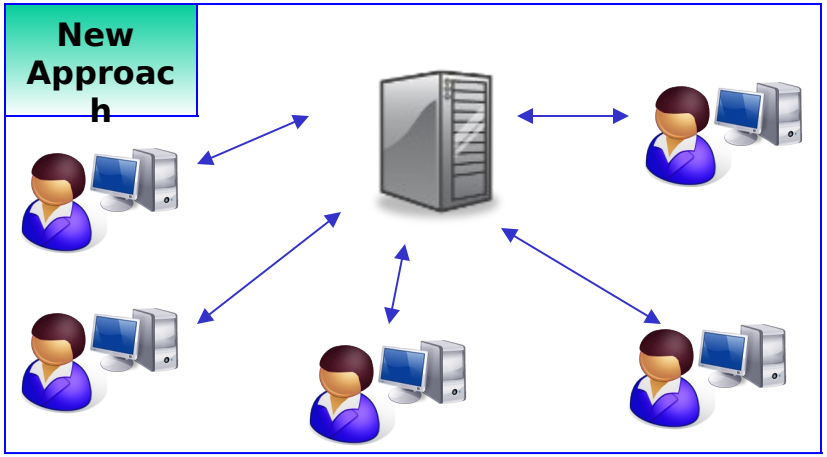
Duplicated efforts

Used disparate tools and processes

The new approach strives for

- Data flowing among linked algorithms across organizational boundaries
- Open architecture that is flexible enough to utilize existing applications and services





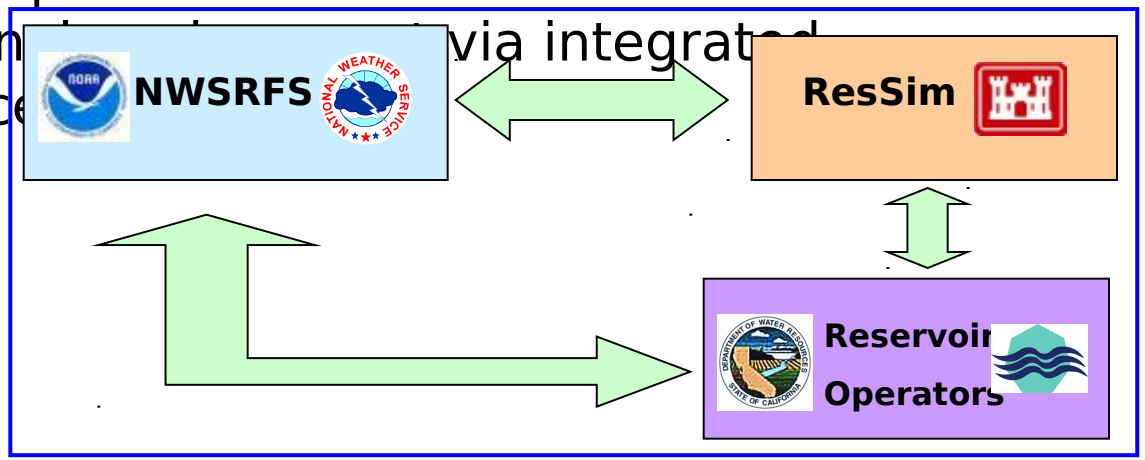
Linked System to Enhance Real-time Operations

California reservoir operators (Yuba Co. Water Agency and CA Dept of Water Resources) use the ResSim model developed by the Army Corps of Engineers to manage these dams

The River Forecast Center in Sacramento uses the National Weather Service River Forecast System (NWSRFS) to produce river forecasts

ResSim is being added to NWSRFS via CHPS architecture

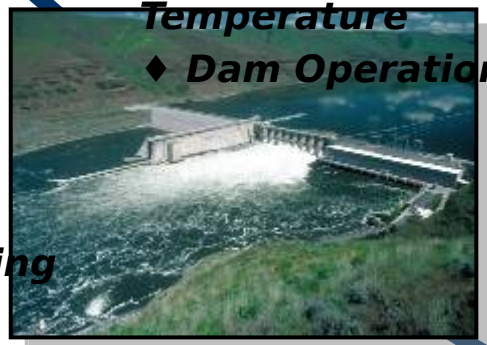
By October 2007, all partners will have access to data from the unified operation via integrat communication proce



Long-range Objective: "Summit to the Sea" Water Information System

Freshwater Spawning/Rearing

- ***Snowpack***
- ***Air Temperature***
- ***Nutrients***



Downstream Migration

- ***River Flow***
- ***Water Temperature***
- ***Dam Operations***

Estuary/Early Ocean

- ***Water temperature and turbidity***
- ***Nutrient Availability and Quality***

Communicating Flood Risk

- For over 25 years, the NWS has utilized a 3-tier, impact based, flood severity scale with the categories minor, moderate, and major

- For each NWS river forecast location, flood stage and the stage associated with each of the NWS flood se
established in cooperation with local publ

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/KINN7.1.ER.010407T1300Z.010412T0100Z.000000T0000Z.NO/
200 PM EDT FRI APR 6 2001

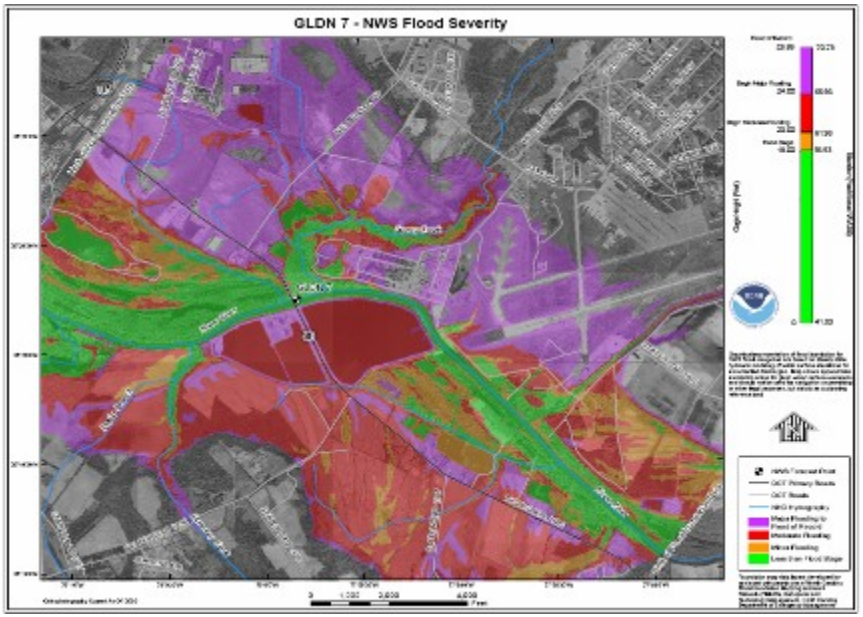
THE NATIONAL WEATHER SERVICE IN NEWPORT HAS ISSUED A
• FLOOD WARNING FOR NEUSE RIVER AT KINSTON
• FROM SATURDAY MORNING UNTIL FURTHER NOTICE
• AT 9 AM EDT FRIDAY THE STAGE WAS... 13.5 FEET
• MINOR FLOODING IS FORECAST * FLOOD STAGE IS...14.0 FEET
• FORECAST...FLOOD STAGE WILL BE REACHED AT 900 AM SATURDAY. MAXIMUM STAGE WILL BE 15.0 FEET AT 900 PM EDT WEDNESDAY. THE RIVER MAY REMAIN ABOVE FLOOD STAGE FOR SEVERAL WEEKS. THE EXACT FLOOD DURATION IS DIFFICULT TO PREDICT DUE TO THE VERY SLOW RISE AND FALL TIMES FOR THIS RIVER.
• AT 14 FEET...WATER WILL BEGIN TO OVERFLOW INTO LOWLANDS ADJACENT TO THE NEUSE RIVER. $$

Hydrograph
River at a Glance
Weekly Chance of Exceeding Levels
Chance of Exceeding Levels During Entire Period
Little Wabash River AT Carmi
Universal Time (UTC)
Latest observed value: 33.11 ft at 6:00 AM CST 14-Mar-2006.
Forecast data shown here are guidance values only. Please refer to your local NWS office for the latest official public river forecasts.
Record Stage 38.4'
Major Stage 35.0'
Moderate Stage 32.0'
Flood Stage 27.0'
33.11 ft
34.9 ft
Stage (ft)
Flow (kcfs)
Site Time (CST)
Graph Created (7:37am Mar 14, 2006)
Observed
Forecast (issued 8:47pm Mar 13)
Observations courtesy of the US Geological Survey
Printable Image
About this graph
Tabular Data
XML Data
NOTE: Forecasts for the Little Wabash River at Carmi are issued routinely year-round.
Default Hydrograph
Return to Area Map

http://www.weather.gov/ahps/

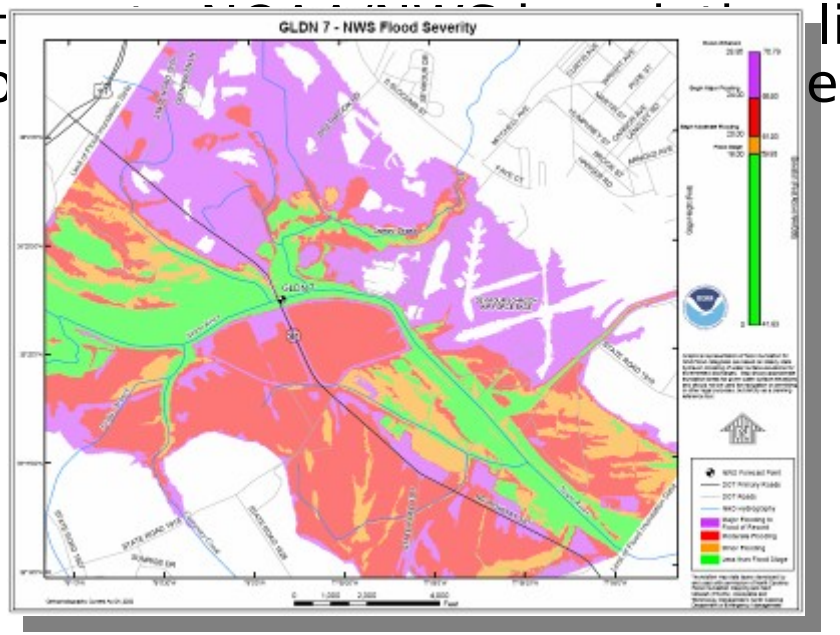
Enhancing the Communication of Flood Risk

- Customers are telling us they….
  - are familiar with NWS flood severity categories
  - find them useful
  - do not want changes to the existing flood severity indices
  - need communication of flood risk to be enhanced by use of inundation graphics (maps)



NOAA-FEMA Collaboration

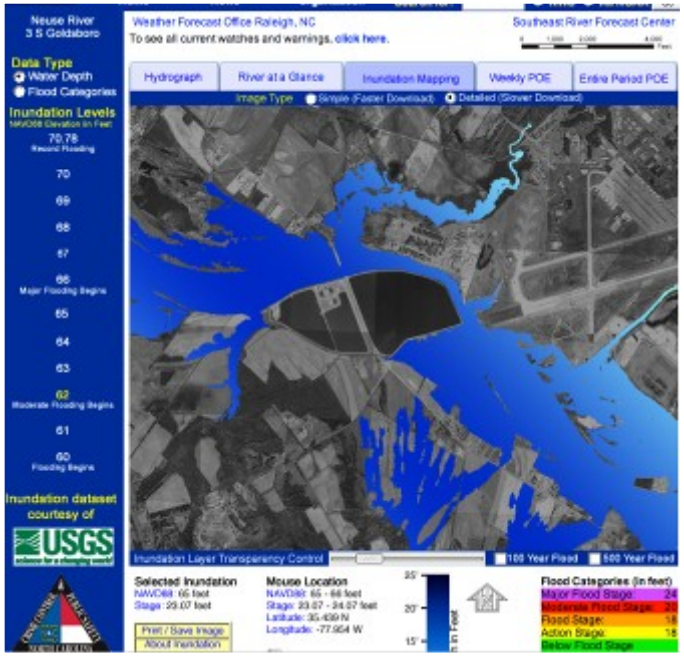
- Decision-makers need additional/integrated inundation maps/information to most effectively mitigate the impacts of floods
- Opportunity for enhanced relationship between National Flood Insurance Program flood zones and NWS flood categories/libraries
- Int[illegible] library guidelines with FEMA Flo[illegible]es to produce

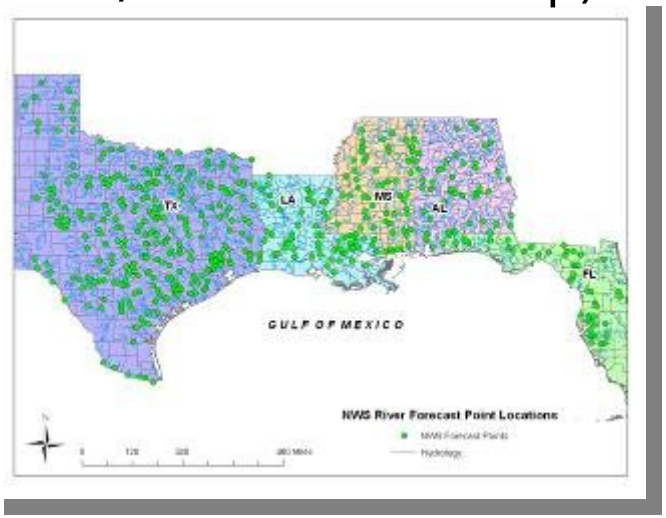


"The problem for our emergency responders during flooding is that we rush over our floodplain maps but they are basically a 100 year storm event that rarely informs the expected flooding from a particular storm event"

Flood Forecast Demonstration Projects

- Provide Web Access to 17 North Carolina Flood Forecast Inundation Map Libraries at NWS forecast points by October 2007 (NOAA/USGS partnership)
- Hurricane Katrina Supplemental Funds are being used to create an additional 30-35 libraries in 5 Gulf Coast States (NOAA/FEMA Partnership)





Flood Inundation Mapping
Web Interface

Benefits of the Community-based Partnership for Water Forecasting

Leveraging partner capabilities leads to vast systemic improvements

Objectives:

- Common understanding and improved communications
- Link organizations that are advancing hydrologic research
- Deliver well-applied technology for a higher degree of real-time interagency collaboration
- Demonstrate the enhanced productivity of a **One Government** approach

Interagency collaboration yields **cost-effective** outcomes:

- Increased public safety
- Enhanced levels of flood protection
- Better information for water management